

WHAT IS CLAIMED IS:

1. A method of adaptive encoding at least a part of a current frame of a sequence of frames of framed data, the method comprising:

dividing the part of the current frame into blocks;

5 performing a first sub-encoding on a first block or set of blocks;

performing a second sub-encoding on the first sub-encoded block or at least one block of the first set of blocks, the second sub-encoding adapting at least one encoding parameter based upon a quantity of the first sub-encoded part of the current frame, the quantity being determined by prediction at least in part from of the frames of the sequence only those frames that are a reference frame; and

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performing the first sub-encoding and the second sub-encoding on another block or set of blocks of the part of the current frame.

2. The method of Claim 1, wherein performing the first sub-encoding and performing the second sub-encoding are performed on another block or set of blocks of the part of the current frame in the foregoing listed order.

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3. The method of Claim 1, wherein computing of the quantity identifies the time elapsed between the current frame and the reference frame or frames.

4. The method of Claim 1, wherein the encoded frames are transmitted over a transmission channel and wherein the adaptive encoding method compensates for channel bandwidth limitations and adapts the second sub-encoding parameters based at least in part upon the quantity.

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5. The method of Claim 1, wherein the adaptive encoding of at least a part of the current frame is performed with respect to a reference frame, the first sub-encoding comprising:

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performing transformation parameter estimation of a block with respect to the reference frame; thereafter

performing transformation compensation on the block; and thereafter determining the error block.

6. The method of Claim 1, wherein the second sub-encoding is selected from the group comprising: wavelet encoding, quadtree or binary tree coding, DCT coding and matching pursuits coding.

7. A method of adaptive encoding at least a part of a current frame of a sequence of frames of framed data, with respect to a reference frame comprised in the sequence, the method comprising:

dividing the reference frame into blocks and labeling the blocks of the reference frame in accordance with the performance of a first sub-encoding that is applied to the reference frame;

computing a quantity based on the labeling of the blocks and from the frames of the sequence only those frames that are a reference frame;

performing the first sub-encoding on the current frame; and

performing a second sub-encoding on the first sub-encoded frame, the second sub-encoding adapting at least one encoding parameter based at least in part upon the computed quantity.

8. The method of Claim 7, wherein the computing of the quantity identifies the time elapsed between the current frame and the reference frame.

9. The method of Claim 7, wherein the labeling of the blocks depends upon motion vectors determined for the blocks.

10. The method of Claim 9, wherein the blocks of the reference frame have a first label when the blocks are intra-coded or when the blocks have a substantial zero motion vector, the blocks of the reference frame have a second label otherwise, the computed quantity being the sum of:

the sum of all measures of prediction errors of blocks with a first label;

and

a normalized sum of all measures of prediction errors of blocks with a second label multiplied with the time elapsed between the current frame and the reference frame.

11. An apparatus for adaptive encoding of a part of a current frame of a sequence of frame of framed data, the apparatus comprising:

an encoder capable of performing first and second sub-encoding on a block or a set of blocks of the current frame and for adapting encoding parameters of the second sub-encoding based at least in part upon a quantity related to the block or set of blocks of the current frame after it has been first sub-encoded; and

a decision circuit capable of determining the quantity by prediction only from a reference frame or reference frames.

12. An apparatus for adaptive encoding at least a part of a current frame of a sequence of frames of framed data, with respect to a reference frame comprised in the sequence, comprising:

an encoder for first sub-encoding the reference frame;

means for dividing the reference frame into blocks and labeling the blocks of the reference frame in accordance with the output of the encoding circuit;

means for computing a quantity based on the labeling of the blocks and only on the reference frame or reference frames;

an encoder for performing the first sub-encoding on the current frame;

an encoder for performing a second sub-encoding on the first sub-encoded frame; and

means for adapting the encoding parameters of the encoding circuit for the second sub-encoding at least based on the quantity.

13. A method of implementing a two step encoding method, the two step encoding method comprising a first sub-encoding and a second sub-encoding, the method being applied to a current frame of a sequence of frames of framed data, the method comprising:

performing a decision step, the decision step being based on an estimate of a quantity of the current frame that would be obtained when applying the first sub-encoding step to the current frame, the estimated quantity being determined by prediction from at least in part a reference frame or reference frames, the decision step deciding whether the two step encoding method is to be applied to the current frame or not.

14. The method of Claim 13, wherein the encoded frames are transmitted over a channel and the method identifies channel bandwidth limitations.

15. A method of adaptive encoding at least a part of a current frame of a sequence of frames of framed data, with respect to a reference frame comprised in the sequence, the method comprising:

dividing the reference frame into blocks and labeling the blocks of the reference frame in accordance with the performance of a first sub-encoding that is applied to the reference frame;

computing a quantity based upon the labeling of the blocks and only on the reference frame or reference frames;

deciding based on the computed quantity to perform or skip encoding the current frame; and

if encoding is performed, performing the first sub-encoding on the current frame and a second sub-encoding on the first sub-encoded frame.

16. A method of adaptive encoding at least a part of a current frame of a sequence of frames of framed data with respect to a reference frame comprised in the sequence, the method comprising:

dividing the reference frame into blocks and labeling the blocks of the reference frame in accordance with the results of a first sub-encoding that is applied to the reference frame;

computing a quantity that is based at least in part upon the labeling of the blocks and at least in part upon the reference frame or reference frames;

dividing the current frame into blocks;

performing the first sub-encoding on a block of the current frame; and

performing a second sub-encoding on the first sub-encoded block of the current frame, and adapting, in the second sub-encoding, wherein the encoding parameters are based at least in part upon the computed quantity.

17. An apparatus for implementing a two step encoding of a current frame of a sequence of frames of framed data, the two step encoding comprising a first sub-encoding and a second sub-encoding step, comprising:

means for calculating an estimate of a quantity of the current frame by prediction from only a reference frame or reference frames of the quantity that would be obtained when applying the first sub-encoding to the current frame; and

5 a decision circuit for deciding, based at least in part upon the estimated quantity, whether the two step encoding will be applied to the current frame or not.

18. An apparatus for adaptive encoding of at least a part of a current frame of a sequence of frames of framed data with respect to a reference frame comprised in the sequence, the apparatus comprising:

 an encoder for applying a first sub-encoding to the reference frame;

 means for dividing the reference frame into blocks and for labeling the blocks of the reference frame in accordance with the output of the encoding circuit;

15 means for computing a quantity based upon the labeling of the blocks and at least in part upon the reference frame or reference frames;

 means for deciding based on the quantity to perform or skip encoding of the current frame; and

 an encoder for performing the first sub-encoding on the current frame and

 an encoder for performing a second sub-encoding on the first sub-encoded frame in response to the decision circuit determining that the encoding is performed.

19. An apparatus for adaptive encoding of at least a part of a current frame of a sequence of frames of framed data with respect to a reference frame comprised in the sequence, the apparatus comprising:

 an encoder for applying a first sub-encoding to the reference frame;

 means for dividing the reference frame into blocks and labeling the blocks of the reference frame in accordance with the output of the encoding circuit;

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means for computing a quantity based on the labeling of the blocks and of the frames in the sequence only on the reference frame or reference frames;

means for dividing the current frame into blocks;

an encoder for performing a second sub-encoding on the aid first sub-encoded block of the current frame, and

an encoder for performing the first sub-encoding on a block of the current frame; and

means for adapting the encoding parameters of the second sub-encoding circuit based on at least the quantity.

20. A method of adaptive encoding at least a part of a current frame of a sequence of frames of framed data, the method comprising:

dividing at least part of the current frame into blocks;

performing a first sub-encoding on one of the blocks;

performing a second sub-encoding on the first sub-encoded block, wherein the second sub-encoding adapts at least one encoding parameter based upon a predicted quantity that is determined at least in part by evaluating a characteristic of a reference frame; and

performing the first sub-encoding and the second sub-encoding on another block of the part of the current frame.

21. The method of Claim 20 wherein the first sub-encoding and thereafter the second sub-encoding are performed on another block of the part of the current frame.

22. The method of Claim 20, wherein the encoded frames are targeted for transmission over a transmission channel and wherein the method accounts for channel bandwidth limitations by adapting the second sub-encoding parameters based on the quantity.

23. The method of Claim 20, wherein the adaptive encoding of at least a part of the current frame is performed with respect to a reference frame, the first sub-encoding comprising:

performing transformation parameter estimation of a block with respect to the reference frame;

performing transformation compensation on the block; and
determining an error block.

24. The method of Claim 20, wherein the second sub-encoding is selected from the group comprising wavelet: encoding, quadtree or binary tree coding, DCT coding and matching pursuits coding.

25. A method of adaptive encoding at least a part of a current frame of a sequence of frames of framed data, with respect to a reference frame comprised in the sequence, the method comprising:

dividing the reference frame into blocks;

labeling the blocks of the reference frame in accordance with the performance of a first sub-encoding that is applied to the reference frame;

computing a quantity based on the labeling of the blocks;

performing the first sub-encoding on the current frame; and

performing a second sub-encoding on the first sub-encoded frame, wherein the second sub-encoding adapts at least one encoding parameter based on the computed quantity.

26. The method of Claim 25 wherein the computing of the quantity is derived at least in part by calculating the time elapsed between the current frame and the reference frame.

27. The method of Claim 25, wherein the blocks of the reference frame have a first label when the blocks are intra-coded or when the blocks have a substantial zero motion vector, the blocks of the reference frame have a second label otherwise, the computed quantity being the sum of:

the sum of all measures of prediction errors of blocks that have a first label; and

a normalized sum of all measures of prediction errors of blocks that have a second label multiplied by the time elapsed between the current frame and the reference frame.

28. An apparatus for adaptive encoding of a part of a current frame of a sequence of frames of framed data, the apparatus comprising:

an encoder capable of performing a first sub-encoding and a second sub-encoding on a block of the current frame and for adapting encoding parameters of the second sub-encoding based at least in part upon a quantity that is related to the block of the current frame after the block has been first sub-encoded; and

5 a decision circuit capable of predicting a characteristic of the current frame after at least one of the blocks of the current frame have been first sub-encoded.

29. An apparatus for adaptive encoding at least a part of a current frame of a sequence of frames of framed data, with respect to a reference frame comprised in the sequence, the apparatus comprising:

10 an encoder for first sub-encoding the reference frame;
means for dividing the reference frame into blocks and labeling the blocks of the reference frame in accordance with the output of the encoding circuit;

15 means for computing a quantity based on the labeling of the blocks;
an encoder for performing the first sub-encoding step on the current frame; and

an encoder for performing a second sub-encoding on the first sub-encoded frame and means for adapting the encoding parameters of the encoding circuit for the second sub-encoding based on the quantity.

20 30. A method of implementing a two-step encoding method, the two-step encoding method comprising a first sub-encoding and a second sub-encoding, the two-step encoding method being applied to a current frame of a sequence of frames of framed data, the method comprising:

25 determining whether to perform a two-step encoding method, wherein the determining is based at least in part upon a quantity of the current frame that would be obtained when applying the first sub-encoding step to the current frame, wherein the quantity is determined by prediction from a reference frame.

30 31. The method of Claim 30, wherein the encoded frames are targeted for transmission over a channel and wherein the method accounts for channel bandwidth limitations.

32. A method of adaptive encoding at least a part of a current frame of a sequence of frames of framed data, with respect to a reference frame comprised in the sequence, the method comprising:

dividing the reference frame into blocks and labeling the blocks of the reference frame in accordance with the performance of a first sub-encoding that is applied to the reference frame;

computing a quantity that is based at least in part upon the labeling of the blocks;

deciding, based on the computed quantity, whether perform or skip encoding the current frame;

if encoding is performed, performing the first sub-encoding on the current frame and a second sub-encoding on the first sub-encoded frame.

33. A method of adaptive encoding at least a part of a current frame of a sequence of frames of framed data with respect to a reference frame comprised in the sequence, the method comprising:

dividing the reference frame into blocks;

labeling the blocks of the reference frame in accordance with the performance of a first sub-encoding applied to the reference frame;

computing a quantity that is based at least in part upon the labeling of the blocks;

dividing the current frame into blocks;

performing the first sub-encoding on a block of the current frame; and

performing a second sub-encoding on the first sub-encoded block of the current frame, and adapting, in the second sub-encoding, the encoding parameters thereof based on the computed quantity.

34. An apparatus for implementing a two-step encoding of a current frame of a sequence of frames of framed data, the two-step encoding comprising a first sub-encoding and a second sub-encoding step, comprising:

means for calculating a quantity of the current frame by prediction from a reference frame of the quantity that would be obtained when applying the first sub-encoding to the current frame; and

a decision circuit for deciding, based on the quantity whether the two-step encoding will be applied to the current frame or not.

35. An apparatus for adaptive encoding of at least a part of a current frame of a sequence of frames of framed data with respect to a reference frame comprised in the sequence, comprising:

an encoder for applying a first sub-encoding step to the reference frame;
means for dividing the reference frame into blocks and for labeling the blocks of the reference frame in accordance with the output of the encoding circuit;

means for computing a quantity based on the labeling of the blocks;
means for deciding based on the quantity to perform or skip encoding of the current frame;

an encoder for performing the first sub-encoding on the current frame;
and

an encoder for performing a second sub-encoding on the first sub-encoded frame in response to the decision circuit determining that the encoding is performed.

36. An apparatus for adaptive encoding of at least a part of a current frame of a sequence of frames of framed data with respect to a reference frame comprised in the sequence, comprising:

an encoder for applying a first sub-encoding to the reference frame;
means for dividing the reference frame into blocks and labeling the blocks of the reference frame in accordance with the output of the encoding circuit;

means for computing a quantity based on the labeling of the blocks;
means for dividing the current frame into blocks;
an encoder for performing the first sub-encoding on a block of the current frame;

an encoder for performing a second sub-encoding on the first sub-encoded block of the current frame; and

